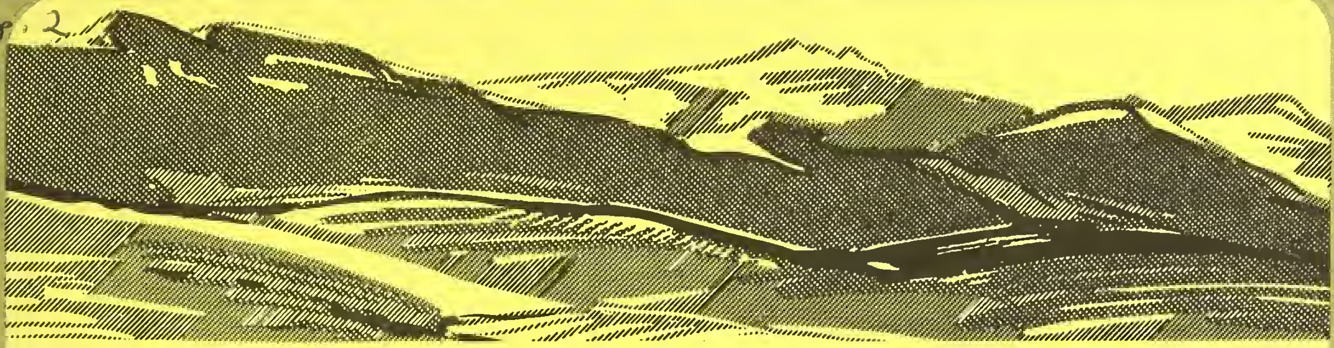

RANGE IMPROVEMENT NOTES

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INDEX

FOREST SERVICE — U. S. DEPARTMENT OF AGRICULTURE
INTERMOUNTAIN REGION — OGDEN, UTAH

STATEMENT OF PURPOSE

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This publication is printed primarily to inform professional range administrators of important range improvement and management developments and findings. These "NOTES" may include extracts of published papers, unpublished preliminary reports of research work, unpublished reports on administrative studies and personal observations or suggestions of other range administrators. No claim is made as to the accuracy or completeness of studies or conclusions drawn.

All who read these RANGE IMPROVEMENT NOTES are encouraged to submit material for publication, or suggestions for improving its usefulness. Full credit will be given for any material used.

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PLANTATION GRAZING STUDY

By

Donald E. Peterson*

With the high intensity of timber harvest operations and subsequent reforestation on the Boulder Ranger District, it has become imperative that plantations be used for domestic stock grazing as soon as possible after planting in order to prevent either overuse of the remainder of an allotment or an extended reduction in the permitted number of animals on an allotment. The purpose of these grazing studies is to find when and how these plantations can be grazed by sheep without an appreciable amount of damage to tree seedlings.

The previous years' studies involved grazing only several selected plantations on a trial basis. The 1970 study involved grazing many units of the North Star and Huckleberry Plantations.

Design of Study

One band of sheep containing 830 ewes with 1,141 lambs, spent 42 days from July 2 to August 20 grazing 787 acres (16 units) in plantations of the North Star Sale area which produced about 1,256 lbs./acre (dry weight) of available forage. They used about 46 percent or 578 lbs./acre.

The other band of sheep containing 786 ewes with 1,059 lambs, spent 45 days from July 2 to August 20 grazing 833 acres (23 units) in plantations of both the Huckleberry and the North Star Sale areas which produced about 1,094 lbs./acre (dry weight) of available forage. They also used about 46 percent or 500 lbs./acre.

The entire allotment is operated under a rest-rotation system of management. The rotation schedule dictated in what order the plantations could be used.

Several problems arose that had to be solved on the spot. They were:

1. Finding adequate watering places to avoid retracing a route through a plantation to get water. In most cases, the herders were instructed to avoid grazing plantations where this problem was the most severe.

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2. Getting the sheep to bed outside the plantations. Bear kills were quite high and the sheep became so leary of predatory animals that they would hardly retreat into the timbered buffer strips to bed. The herders were instructed to find a rocky "knob" to use as a bed and salt ground.

3. Finding adequate feed for pack and saddle stock outside units. A staked or hobbled horse or mule can cause severe trampling damage. Herders were instructed to stake their stock in areas where there were no or very few trees. Many times they had to use areas 1/4 to 1/2 miles away from their camp.

Extent of Damage

Previous studies on the Boulder District have shown that damage to Engelmann spruce and Douglas-fir seedlings have been either by trampling or sluffing of soil onto them. Damage to ponderosa pine seedlings was also by trampling or soil sluffing; but the principal damage has been due to sheep eating portions of the seedling, usually the terminal or lateral buds.

With this in mind, the plantations were grazed. People who were aware of exactly what the conditions of the plantations were before grazing, observed no immediate appreciable damage to any of the various species of tree seedlings in any of the different height or age classes. The criteria as spelled out later in this report was used to avoid this damage. There were a few localized exceptions. The sheep were bedded in one plantation of mixed species of both natural and planted stock. Bedding destroyed about 150 trees/acre, mostly natural white fir. This unit, however, had 2,180 trees/acre prior to sheep entry. Trailing sheep into one plantation trampled several trees on the edge of the unit. Also the terminal buds of a few ponderosa pine seedlings growing along the edge of the unit had been eaten.

The plantations will be inspected next summer to evaluate long-term effects of exposure to sheep grazing.

Many plantations, mostly in the Huckleberry Sale units, have a considerable number of naturally stocked seedlings in addition to the planted stock. They are mostly white fir seedlings, but also include western larch, Douglas-fir and the lesser important lodgepole pine. They are, in 90 percent of the cases, shorter in height than the planted stock. They average about 10 inches in height but range from 2 inches (white fir) to 40 inches (western larch). Some people felt

that these smaller naturals could not sustain grazing pressure. This becomes very important where planted stocking levels are below optimum and the naturals are needed for an adequately stocked plantation. Very little damage to these seedlings was noticed by the administrator; but to document these conditions, a unit typifying the average plantation conditions was chosen and a 15 by 27-foot plot was established. All planted and natural seedlings were identified before grazing by species and height classes. On the 40.5-square-foot plot, forage utilization was about 50 percent, with a soil disturbance of about 30 percent. There was no immediate damage to any of the planted or natural stock. The trees will be inspected again next summer to evaluate long-term effect.

Benefits of Plantation Grazing

Benefits derived from grazing plantations are:

1. Adhering to the rest-rotation schedule prescribed for this allotment. The allotment now can begin to show the expected recovery of a properly managed rest-rotation allotment where all the units are used. Previously, protection of the plantations required deferring the majority of five units on the six-unit system. It was impossible to operate the remainder of the allotment under a rest-rotation system. The permittee has cooperatively been taking partial non-use since the plantations were deferred.

2. Destroying white-footed deer mice habitat. Personnel from the Bureau of Sports Fisheries and Wildlife Control say that sheep trampling destroys the white-footed deer mice habitat which, when feeding upon cambium of the tree seedlings during the winter months, causes serious loss to plantation stocking.

3. Increases in the weight of lambs. Weight of lambs fed in plantations compared with weights of lambs of adjacent allotments show a substantial increase.

	Average Lamb Weight - 1970
Boulder Creek Allotment	102 lbs.
Price Valley Allotment	98 lbs.
Curren Hill Allotment	90 lbs.
Sheep Creek Allotment	90 lbs.

It is noted, however, that the Boulder Creek Allotment has produced better lambs for the past several years and all differences cannot be attributed to plantation grazing.

A substantial reduction in the number of green leaves of competing vegetation by sheep grazing reduces the amount of water and nutrient uptake and in this sense makes more water and nutrients available for tree seedlings. This is especially important during the drier months of July, August, and early September. Also, however, a reduction in the total cover on a plantation causes an increase in the amount of soil moisture lost to evaporation and subsequently causes an increase in soil temperature. For this reason, one must be very careful in assuming that a reduction in plant competition by sheep grazing is a derived benefit to natural regeneration tree survival. However, it is doubtful that foliage removal by grazing affects survival of planted stock. Competition removal by grazing is generally beneficial to ponderosa pine and western larch as it has been repeatedly observed that growth rates increase and the trees are able to outgrow and overtop the competing vegetation sooner. Conversely though, it has been observed that the tolerant species such as white fir, spruce, and Douglas-fir are adversely affected by shade removal and survival is affected. Thus, while grazing may not directly affect survival of the tolerant species, survival is indirectly affected by cause of shade removal.

Criteria for Plantation Grazing

From these and previous studies, criteria for grazing 4-year-old or older plantations have been developed. This criteria applies for the protection of tree seedlings. As soon as the chance of damage from sheep grazing to tree seedlings becomes low, general range grazing criteria may be used to protect other values of the area. It must be completely understood that these criteria apply only to the areas previously described and may not work in all cases. It may, however, be indicative that young plantations can successfully be grazed without causing any substantial loss to tree seedlings. These criteria are:

1. Use a herder who can understand and is willing to comply with instructions.

2. Use workable and sensible herder instructions, realizing that in most cases the herder knows a lot more about sheep than the administrator. It is essential to maintain a good rapport between the herder and the administrator and seek full cooperation from the herder and the permittee.

The two above criteria are no more important than in a normal range allotment operation, but they do mean the success or failure of plantation grazing and as such, are probably the two most important criteria.

3. Do not bed or bunch sheep in plantations. Any close congregation of sheep in plantations causes too much damage to tree seedlings through breakage.

4. Do not move sheep downhill as soils are usually frail and easily displaced causing sluffing of soils onto trees, which is particularly damaging to the smaller ones.

5. As soils in plantations become drier and more easily displaced, the steeper plantations should not be grazed. No quantitative measurements of soil moisture were made; however, in this area generally after August 1 plantations over 35 percent slope should not be used and after August 15 up to September 10 plantations on slopes greater than 25 percent should not be used.

6. Old skid trails should not be used to "file" sheep into or out of a plantation. This has the same effect as trailing sheep on a driveway. In some cases it is very difficult to do otherwise.

7. Sheep should not be trailed from plantation to plantation, but should be allowed to graze in between. If sheep are not somewhat full upon entering a plantation, they will feed upon any available forage and many times nip at the terminal or lateral buds of young ponderosa pine seedlings. Browsing on other tree species has not been a problem. If somewhat full, they will be more selective, choosing the more palatable forage.

8. Do not graze plantations until after the needles of the ponderosa pine seedlings have broken the "candle" and are at least 1/4 inch long. This allows some protection from sheep nipping the tender young new growth.

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CLOWNS belong in the CIRCUS

Not on the JOB.

The Practical Joker causes accidents,

Color him DANGEROUS ! ! !

CONTROL OF LARKSPUR WITH HERBICIDE PLUS NITROGEN FERTILIZER

By

Wayne Binns, Lynn F. James, and A. Earl Johnson[1]

Tall larkspur (Delphinium spp.) is the most important poisonous plant in the western United States in terms of cattle poisoned (Kingsbury, 1964). Mortality among cattle grazed on ranges where larkspur grows may vary (1 to 20%). The plant is a problem not only because of economic losses from cattle deaths, but also because it interferes with range improvement programs. Cattle must be fenced or herded off many large range areas to prevent poisoning.

Attempts to eradicate larkspur by grubbing have proved inadequate and expensive (Welsh and Morris, 1956); Durrell, Jensen, and Klinger, 1952). Larkspur ranges can be successfully grazed by sheep and horses, and it has been reported that grazing by sheep may help control it (Durrell, Jensen, and Klinger, 1950); Aldous, 1917).

Single treatments of tall larkspur with 2,4-dichlorophenoxyacetic acid (2,4-D) or 2, 4,5-trichlorophenoxyacetic acid (2,4, 5-T) have been reported to be ineffective (U.S. Department of Agriculture, 1968) although good control has been obtained with 2,4,5-T and 2-(2,4,5-trichlorophenoxy) propionic acid (silvex) on tall larkspur in the prebud stage (Torell and Haas, 1963). Two or three annual spray treatments with 2,4,5-T have greatly reduced the vigor of tall larkspur (Baker, 1964) and repeated yearly applications of silvex and propylene glycol butyl esters of 2,4,5-T greatly reduced but failed to totally control the plant (Cronin and Roberts, 1965). 4-amino-3,5,6-trichloropicolinic acid (picloram) plus 2,4,5-T has given complete control of larkspur when applied for two years (Alley and Lee,1969). 3-amino-s-triazole (amitrole) and several triazines have been ineffective against tall larkspur or have injured the associated grasses excessively (Baker,1964).

This paper reports a portion of a preliminary study that was designed to devise a method for controlling larkspur on small inaccessible areas without using expensive equipment.

The research was initiated in 1956 and terminated in 1960 due to uncontrollable circumstances before some results could be completely determined. Because complete, long-time control was apparent on some test areas, the U. S. Forest Service requested the plots again be inspected in 1969. This report presents data from that inspection along with previously unreported data.

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[1] Animal Disease and Parasite Research Division, Agr. Res. Serv. USDA, Logan, Utah. Reprinted from Jour. of Range Management, Vol. 24, No. 2, March 1971, pp. 110-113.

Methods

Three areas where tall larkspur (Delphinium barbeyi) poisoning had been a serious problem were selected for control experiments using herbicides, 2,4-D and 2,4,5-T and soil sterilants, 1,1, dimethyl-3-phenyl urea (fenuron) and sodium tetra borate (DB granular). Two of the areas were in the Fishlake National Forest; one was in the Manti-LaSal National Forest. Both National Forests are in Utah, with elevations near 10,000 feet and annual precipitations in excess of 30 inches.

The herbicides were used in conjunction with ammonium sulfate, $(NH_4)_2SO_4$, (19% N) and urea (44%N). Sand was used as a control for the nitrogen fertilizer.

A total of 80, 16x16 foot plots were established, but only 34 of these can be included in this report.

The herbicides used and methods and rates of application are shown in Table 1. Three methods of application were used: broadcast, spray, and individual treatment at the base of each plant. Rates of application on a per-acre basis are given only for sprayed treatments. Where applications to individual plants are made, percentage by weight of active herbicide ingredients in the herbicide carrier mixture is given.

Ammonium sulfate or sand was used as a carrier for herbicides that were broadcast or placed around the base of the plant. Herbicide and carrier were mixed in a Hobart-type electric mixer in approximately 30-pound lots to achieve a uniform mixture of herbicide and carrier. The urea was dissolved in water and sprayed on the plant.
Fenuron and DB granular were used on eight plots. Data on fenuron is not included in Table 1.

The experimental plots were observed after one year, in a few cases two years, and again 10 to 12 years after treatment.

Results

The results of the various treatments and methods of application are shown in Table 1.

Application of 2,4,5-T and $(NH_4)_2SO_4$ to the base of the plant during its prebloom or seed stage gave good control. Some control was noted in all plots one year after treatment and almost complete control after 10 years. Only one plot could be identified of those treated with 2,4-D and $(NH_4)_2SO_4$. It showed no control at the end of one year, but complete control after ten years.

Table 1. Estimated kill of larkspur with combinations of 2,4-D, 2,4,5-T, and nitrogen fertilizers.

Treatment					Estimated % kill years post treatment		
Herbicide	Carrier	Rate of application	Method of application	Stage of growth	One	Two	10-12
		(% by weight active herbicides)					
2,4,5-T*	$(NH_4)_2SO_4$	3.0	Base of plant	prebloom	90		98
2,4,5-T	$(NH_4)_2SO_4$	3.0	Base of plant	prebloom	95		—
2,4,5-T	$(NH_4)_2SO_4$	1.5	Base of plant	prebloom	90		98
2,4,5-T	$(NH_4)_2SO_4$	1.5	Base of plant	prebloom	90		98
2,4,5-T	$(NH_4)_2SO_4$	1.5	Base of plant	prebloom	95		—
2,4,5-T	$(NH_4)_2SO_4$	1.5	Base of plant	prebloom	95		—
2,4,5-T + 2,4-D**	$(NH_4)_2SO_4$	1.5 + 1.5	Base of plant	prebloom	90		98
2,4,5-T	$(NH_4)_2SO_4$	1.0	Broadcast	prebloom	60		95
2,4,5-T + 2,4-D	$(NH_4)_2SO_4$	1.0 + 1.0	Base of plant	prebloom	90		98
2,4,5-T + 2,4-D	$(NH_4)_2SO_4$	1.0 + 1.0	Base of plant	prebloom	95		—
2,4,5-T + 2,4-D	$(NH_4)_2SO_4$	1.0 + 1.0	Base of plant	prebloom	95		—
2,4,5-T + 2,4-D	$(NH_4)_2SO_4$	1.0 + 1.0	Broadcast	prebloom	70		95
2,4,5-T	Sand	1.0	Base of plant	seed	11	100	100
2,4,5-T	Sand	0.5	Base of plant	seed	11	100	
2,4,5-T	Sand	5.0	Base of plant	seed	31	100	
2,4-D	Sand	1.0	Base of plant	seed	11	35	0
2,4,5-T	$(NH_4)_2SO_4$	0.5	Base of plant	seed	100	100	
2,4,5-T	$(NH_4)_2SO_4$	1.0	Base of plant	seed	100	100	75
2,4,5-T	$(NH_4)_2SO_4$	0.12	Base of plant	seed		100	100
2,4,5-T	$(NH_4)_2SO_4$	0.25	Base of plant	flower		95	92
2,4,5-T	$(NH_4)_2SO_4$	0.25	Broadcast	flower		100	100
2,4-D	$(NH_4)_2SO_4$	1.0	Sprayed	flower		0	100
		(Herbicide and nitrogen per acre)					
2,4,5-T	Urea	.625 lbs., 88 lbs. N	Sprayed	flower	0		100
2,4,5-T	Urea	.375 lbs., 44 lbs. N	Sprayed	flower	0		100
2,4,5-T	Urea	.625 lbs., 22 lbs. N	Sprayed	flower	0		100
2,4,5-T	Urea	.375 lbs., 88 lbs. N	Base of plant	flower	32		100
2,4-D	Urea	.375 lbs., 88 lbs. N	Sprayed	flower	0		100
2,4-D	Urea	.75 lbs., 88 lbs. N	Sprayed	flower	0		100
2,4-D	Urea	.375 lbs., 44 lbs. N	Sprayed	flower	0		100
2,4-D	Urea	.375 lbs., 22 lbs. N	Sprayed	flower	0		75
——	Urea		Base of plant	flower	31		100
——	$(NH_4)_2SO_4$		Base of plant	flower	6		100

* 2,4,5-T—55% actual acid by weight.
** 2,4-D —59% actual acid by weight.

Spraying larkspur in the flower stage with either 2,4-D plus urea or 2,4,5-T plus urea generally produced complete control of the plant after 10 years though no effect was apparent one year after treatment. Application of 2,4,5-T and urea at the base of plants in the flower stage in one plot, also gave complete control at the end of 10 years and partial control after one year.

The 2,4,5-T in sand applied at the base of the larkspur plants in three plots gave control after two years. Only one of the three could be observed at the end of the 10-year period, but it showed complete control. 2,4-D in sand applied at the base of the plants in one plot in the seed stage was noneffective after 10 years.

Only one plot each was salvaged from those on which $(NH_4)_2SO_4$ or urea had been used alone. Both of these evidenced complete control of the larkspur by the end of the 10-year period.

Excellent stands of grass came into the plots treated with nitrogen fertilizers and herbicide. Cattle grazing these areas had a distinct preference for the forage growing there.

Fenuron and DB granular are both soil sterilants and gave good control for the first year. The soil was without vegetative cover for a period of time, however, and larkspur soon grew back.

Two plots that were treated with DB granular had been treated the year before with 2, 4, 5-T in sand sprinkled around the base of the plant. Larkspur had returned to these areas at the end of the 10-year period.

Discussion

The results suggest that control of larkspur can be obtained by treating it with 2, 4, 5-T and a nitrogen fertilizer during any stage of growth. This, plus the observation that control could be effected with nitrogen fertilizer alone, suggests that nitrogen may be a very useful aid in controlling tall larkspur. The response of the plants to 2, 4, 5-T and $(NH_4)_2SO_4$ may have been due to a combination of factors; the decreased vitality of the larkspur due to the herbicide, the stimulation of the grass by the nitrogen which provided increased competition for the weakened larkspur, and the increased preference for cattle to graze the nitrogen-treated plots.

Spraying tall larkspur in the flower stage with urea and 2, 4-D or 2, 4, 5-T gave excellent results. The fact that others have not been able to obtain good results by spraying with these herbicides alone suggests that the nitrogen is a factor in control. The delayed effect suggests that control was not obtained by merely killing the existing larkspur.

In most plots where plants were treated individually, both nitrogen and herbicide were applied at higher than normal rates. Within plots, application rates varied as the number and size of the plant clusters varied. Thus, in this preliminary study, no attempt is made to give rates of application. It can only be stated that the herbicide-fertilizer mixture was sprinkled evenly over and around the crown of the plant. An attempt to more closely define rates will be given in subsequent reports.

The effectiveness of 2, 4, 5-T in sand around the base of the plant cannot be explained on the basis of the effect noted with herbicides and fertilizer. Short-term control was effected in three plots, but only one plot was available for long-time observation.

When larkspur was treated with 2,4,5-T in sand one year and DB granular the following year, no long-range control resulted. This could have been because all competition to the larkspur was removed, allowing the larkspur to grow when the effect of the soil sterilant was gone.

The nitrogen alone may well have had a deleterious effect on the larkspur at the rate it was applied to some plots. Although just two plots using only nitrogen were retrieved, the results suggest that control may be obtained from fertilizer alone.

It is unfortunate that circumstances did not permit observation of the plots between the 2- and 10-year post-treatment period. This would have prevented the loss of many plots, the most important of which were controls and replicates. Corroborative experiments are underway to further evaluate the preliminary observations of this experiment.

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I was taught when I was young

that if people would only love one another,

All would be well with the world.

This seemed simple and very nice;

but I found when I tried to put it in practice

Not only that other people were seldom lovable,

but that I was not very lovable myself.

George Bernard Shaw

An Observation of Environmental Rodent Control
(Progress Report)

In our April 1970 issue we published a brief report of some observations on the use of artificial roosts to encourage prey birds into a heavily populated gopher area on the Uinta National Forest.

During May 1970, a Cooperative Agreement was entered into between the Brigham Young University Department of Zoology and the Uinta National Forest to study the use of prey roosts. Through the efforts of BYU, the National Audubon Society has contributed financially to the research project. The study is being conducted by Robert C. Christensen as part of his masters degree requirements at Brigham Young University.

Excerpts from Bob's first-year report to the Uinta follow:

Objectives of the Study

1. To determine the food of raptors in the area.
2. To determine how attracted the birds are to the perches.
3. To identify the birds which are using the perches and telephone poles.
4. To determine the relative number of alternate prey species.
5. To determine the effect of predation on gopher populations.

Summary of First-Year Observations

Raptors using the perches were identified by firsthand observation and by identification of feathers which were found under the perches. The major raptors which used the perches were Great Horned Owls and Red-tailed Hawks. Since these birds are territorial in their hunting and nesting behavior, it is most likely that the predation upon gophers and other small rodents in the study area is being done by only a few birds.

Of the approximate 40 raptor pellets collected from beneath the perches, 87 percent showed positive signs of gopher remains. Other animal remains present were those of deer mice, meadow mice, and ground squirrels.

Major conclusions cannot be made at this time; however, thus far the study shows that raptors are being attracted to the perches and gophers make up a considerable part of their diet.